



Department of: Statistics

College of: Administration and Economics.

University of: Salahaddin-Hawler.

Subject: Reliability.

Course Book : 3th stage

Second Semester

Lecturer's name: Dr. Bekhal S. Sedeeq &

Lec. Zainab A. Muhammad

Academic Year: 2022 - 2023

Course Book

1. Course name	Reliability
2. Lecturer in charge	Dr. Bekhal S. Sedeeq & Lec. Zainab Abdulla Muhammad
3. Department/ College	Department of Statistics and information / College of Administration and Economics.
4. Contact	e-mail: Bikhal.sedeeq@su.edu.krd zainab.muhammad@su.edu.krd
5. Time (in hours) per week	For example Theory: 4 hours Practical: 0
6. Office hours	4 hours per week
7. Course code	
8. Teacher's academic profile 1) Dr. Bekhal S. Sedeeq 2) Lec. Zainab Abdulla Muhammad	1) I got a BSc degree from Salahaddin university-Erbil in 1998 in College of Administration & Economics Statistics department. I have earned master's degree in applied Statistics in 2002, and start as assistant lecturer teaching in Statistics department. I got a PhD degree from Salahaddin university-Erbil in 2008 in College of Administration & Economics Statistics department, and I finished my PhD degree in Reliability. I have been teaching in Statistics department at Salahddin University since 2002. I have taught (Principle of Statistics, Reliability, Differential Equations and Decisions theory for under graduated students). I supervised the researches of four student's in MSc degree and during periods of teaching I supervised the researches of graduate student's fourth stage. 2) From 2006 until 2008 worked in Statistics Department - Salahaddin University. In 2011 I had my MSc. In Statistics from same University. From 2011 till now I am working as a Lecturer in Statistics Department- Salahaddin University.
9. Keywords	Introduction to Reliability, Definition of Reliability, The Reliability Function, Failure Lows, System of Reliability- Connection in Series, Connection in Parallel, Mixed connection- Series Parallel, Parallel Series, Bays theorem,...
10. Course overview:	The second part includes Reliability; The objectives of Reliability are To explain how system reliability can be measured and how reliability growth models can be used for reliability prediction, To describe safety arguments and how these are used, To discuss the problems of safety assurance, and To introduce safety cases and how these are used in safety validation.

<p>11. Course objective: The objectives of Reliability are To explain how system reliability can be measured and how reliability growth models can be used for reliability prediction, To describe safety arguments and how these are used, To discuss the problems of safety assurance, and To introduce safety cases and how these are used in safety validation.</p>
<p>12. Student's obligation A student has an obligation to exhibit honesty and to respect the ethical standards of the profession in carrying out his or her academic assignments. Without limiting the application of this principle, a student may be found to have violated this obligation if he or she: (see note concerning more appropriate invocation of University of Pittsburgh Student Code of Conduct and Judicial Procedures)</p> <ol style="list-style-type: none">1. Refers during an academic evaluation to materials or sources, or employs devices, not authorized by the faculty member.2. Provides assistance during an academic evaluation to another person in a manner not authorized by the faculty member.3. Receives assistance during an academic evaluation from another person in a manner not authorized by the faculty member.4. Engages in unauthorized possession, buying, selling, obtaining, or use of any materials intended to be used as an instrument of academic evaluation in advance of its administration.5. Acts as a substitute for another person in any academic evaluation process.6. Utilizes a substitute in any academic evaluation proceeding.7. Practices any form of deceit in an academic evaluation proceeding.8. Depends on the aid of others in a manner expressly prohibited by the faculty member, in the research, preparation, creation, writing, performing, or publication of work to be submitted for academic credit or evaluation.9. Provides aid to another person, knowing such aid is expressly prohibited by the instructor, in the research, preparation, creation, writing, performing, or publication of work to be submitted for academic credit or evaluation.10. Presents as one's own, for academic evaluation, the ideas, representations, or words of another person or persons without customary and proper acknowledgment of sources.
<p>13. Forms of teaching Different forms of teaching will be used to reach the objectives of the course: power point presentations for the head titles and summary of conclusion, classification of material and any other illustrations. There will be classroom discussions and the lecture will give enough background to translate, solve, analyse.</p>
<p>14. Assessment scheme The student must be examined twice in each course. The last grade is (35). Putting grades for daily activities, homework, for (5) marks. The annual work of the material (40) marks. The final exam out of (60) marks. The grades of the annual work and the final exam will be out of (100) marks and the student will be successful if he gets (50) or more.)</p>
<p>15. Student learning outcome: Student learning outcomes statements clearly state the expected knowledge, skills, attitudes, competencies, and habits of mind that students are expected to acquire at an institution of higher</p>

education. Transparent student learning outcomes statements are:

- Specific to institutional level and/or program level
- Clearly expressed and understandable by multiple audiences
- Prominently posted at or linked to multiple places across the website
- Updated regularly to reflect current outcomes
- Receptive to feedback or comments on the quality and utility of the information provided

16. Course Reading List and References:

1. Besterfield, D.H. (1979): Quality Control. Prentice- Hall Inc. New York, U.S.A.
2. Besterfield, D.H. (2004): Quality Control. 7thEdition, Prentice- Hall Inc. New York, U.S.A.
3. Douglas, C. Montgomery. (2005): Introduction to Statistical Quality Control.
4. Grant, E. L. & Leavenworth, R. S. (1988): Statistical Quality Control. 6thEdition, McGraw- Hill Book Company. New York, U.S.A.
5. Juran, J. M. (1974): Quality Control Handbook. 3thEdition, McGraw- Hill Book Company. New York, U.S.A.
6. Robertson, A. G. (1971): Quality Control and Reliability. 8thEdition, pitman press, Bath. London, U.K.
7. David, J. Smith. (1972): Reliability Engineering

17. The Topics:

Lecturer's name:

	Subject	
First week	Part one/ Introduction to Reliability ➤ The Reliability- Definition	Dr.Bekhal samad & Lec. Zainab Abdulla Four hours a week ex: 18/1/2023
Second week	➤ The Reliability Function	
Third week	➤ Failure Lows	
Fourth week	➤ Examples	
Fifth week	➤ System of Reliability- Connection in Series	
Sixth week	➤ Examples	
Seventh week	Exam 1 in (15 Degree)	
Eighth week	➤ Connection in Parallel	
Ninth week	➤ Examples	
Tenth week	➤ Mixed connection- Series Parallel	
Eleventh week	➤ Parallel Series	
Twelfth week	➤ Connection in Parallel	
Thirteenth week	➤ Examples	
Fourteenth week	➤ Bayes theorem	
Fifteenth week	Exam 2 in (20 Degree)	

18. Practical Topics (If there is any)

In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture .

19. Examinations:

1. Assume two units are connected in series and failure rates are λ_1 and λ_2 respectively find:

- 1) Reliability of the system.
- 2) Failure rate.
- 3) $f_{ss}(t)$.
- 4) MTBF.

2. If $\lambda=0.01$ parameter of exponential distribution and $R(t)=0.90$, Find: t [the number of hours as a system operated]

3. prove that: $E(t) = \int_0^{\infty} R(t) dt$

4. : Five components having reliabilities of (0.73, 0.85, 0.56, 0.91, and 0.62) are connected in parallel. What is the system reliability and system unreliability?

5. If (2000) items are put under the test, and if $Z(t) = 2 * 10^{-3}$, find:

- 1) Reliability for 200 hours.
- 2) $N_s(t)$ for 200 hours.
- 3) $N_f(t)$ for 200 hours.

6. If $Z(t) = 3 * 10^{-5}$ find:

- 1) $R(t)$ for 100 hours.
- 2) What is the reliability equal MTTF?

20. Extra notes:

21. Peer review

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